MCV4U Name:_____

Unit 2 Test – Derivatives!
PRACTICE

Expectation	Level Achieved
A3 - verify graphically and algebraically the rules for determining derivatives; apply these rules to determine the derivatives of polynomial, sinusoidal, exponential, rational, and radical functions, and simple combinations of functions; and solve related problems.	
B2. solve problems, including optimization problems, that require the use of the concepts and procedures associated with the derivative, including problems arising from real-world applications and involving the development of mathematical models.	

Thinking More About Communication:

	Incomplete I	**Unacceptable R**	**Poor 1**	**Acceptable 2**	**Good 3**	**Outstanding 4**
TECHNICAL CORRECTNESS OF SOLUTIONS	All or most solutions are blank	No solutions are correct or many left blank	Few solutions are technically correct	Some solutions are technically correct	Most solutions are technically correct	All or almost all solutions are technically correct
PRESENTATION OF SOLUTIONS	All or most solutions are blank	No evidence of presentation or many solutions left blank	Solutions to few problems stand alone	Solutions to some problems can stand alone	Solutions to most problems can stand alone	Solutions to all or almost all problems can stand alone

Expectation A3

1. Determine the slope of the normal to $f(x) = 2x^3 - 5x^2 + 9$ when $x = -2$.

2. Determine the **value(s) of *x*** for which the function $f(x) = x^3 + \frac{6}{7}x^2 - x + 4$ has a slope of 3.

3. Differentiate each function. **Simplify fully**.

a) $y = \frac{x^3 - 2x^2}{x}$

b) $y = x^3(x-2)$

c) $y = (5x^2 + 3x - 6)(4x^2 - 1)$

d) $y = \frac{5x^2 - 2}{3x^2 - 4x + 1}$

e) $y = \frac{1}{(4x+1)^3}$

f) $y = \sqrt{x^4 + 1}$

4. Determine $\frac{dy}{dx}$ when *x* = 3 given $y = \sqrt{2u}$ and $u = x - 1$.

5. Determine the equation of the tangent to the graph of $y = (x^2 + 1)(x^3 + 4x + 1)$ at $x = 1$.

6. For the following distance functions determine the functions for velocity and acceleration.

a) $s(t) = \sqrt{t^2 - 5}$ b) $s(t) = \dfrac{t^2}{t+2}$

7. Determine the absolute extreme values for the following function over the interval $x \in [1, 4]$.

a) $f(x) = 2x^2 + 13x$ b) $f(x) = x^3 + 9x$ c) $f(x) = \dfrac{x^2}{8} - \dfrac{13}{x}$

Expectation B2

8. A box with a square base and no top must have a volume of 5000 cm^3. Determine the dimensions of the box that minimize the amount of material used.

9. A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?

10. We want to construct a box whose base length is 3 times the base width. The material used to build the top and bottom cost \$10/ft^2 and the material used to build the sides cost \$6/ft^2. If the box must have a volume of 50 ft^3 determine the dimensions that will minimize the cost to build the box.

11. We want to construct a box with a square base and we only have 10 m^2 of material to use in construction of the box. Assuming that all the material is used in the construction process determine the maximum volume that the box can have.